REMARKS

This application has been carefully reviewed in light of the Office Action dated May 25, 2004. Claims 1, 16, and 31 have been amended. Claims 1-3, 6-14, 16, 18, 21-29, 31, and 35-45 are pending. Applicants reserve the right to pursue the original claims and other claims in this and other applications. A Petition for Extension of Time (one-month) and Request for Continued Examination are filed concurrently herewith. Applicants respectfully request reconsideration of the above-referenced application in light of the amendments and following remarks.

Claims 1-3, 6-16, 18, 21-31, and 34-45 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Wang in view of Hoff or Ruzyllo. The rejection is respectfully traversed.

The cited references do not disclose or suggest a method of forming a flash memory cell by "forming an insulating layer comprising a first oxide layer . . . a nitride layer . . . a second oxide layer . . . said second oxide layer grown by oxidizing said nitride layer with a gas ambient containing atomic oxygen . . . with an in situ steam generation process," as recited in claim 1.

The cited references do not disclose or suggest a method of forming an ONO insulating structure by "growing a second oxide layer . . . at a temperature of about 850°C to about 1100°C, for about 1 to about 10 minutes, using a gas ambient containing atomic oxygen . . . with an in situ steam generation process," as recited in claim 16.

Similarly, the cited references do not disclose or suggest a method of forming a flash memory array containing a plurality of flash memory cells, each of said plurality of flash memory cells being formed by the acts of "forming an insulating layer comprising a first oxide layer . . . a nitride layer . . . a second oxide layer . . . wherein

said second oxide layer is grown in the presence of atomic oxygen at a temperature of less than about 900°C for a period of about 1 second to 10 minutes with an in situ steam generation process," as recited in claim 31.

Wang is relied upon for disclosing an ONO stack and its method of formation by nitride oxidation. Wang, however, does not disclose the use of atomic oxygen. Ruzyllo or Hoff is relied upon for disclosing the use of atomic oxygen in forming the top oxide layer in an ONO stack. The Office Action asserts that Hoff or Ryzullo would be combined with Wang to allow oxide growth in Wang at low temperatures.

Applicants respectfully submit that the cited references fail to teach, suggest, or disclose forming the second oxide layer with an in situ steam generation process (hereinafter "ISSG process"). The atomic oxygen, in Applicants' claimed ISSG process, oxidizes silicon nitride much faster than dry O_2 or steam. The high oxidation rate of silicon nitride by atomic oxygen with an in situ steam generation process is not taught or suggested in any of the references.

Wang discloses forming the top oxide layer of an ONO stack "using a nitride oxidation technique at about 950°C. with about 5 liters of O_2 and 9 liters of H_2 for about 40 minutes, which grows approximately 50 Å of oxide." (Col. 3, lines 49-54). Hoff and Ruzyllo disclose that a flowing atomic oxygen afterglow process could be used to react with silicon at temperatures as low as 400°C. Accordingly, the cited references do not teach forming a second oxide layer with an in situ steam generation process.

Moreover, there is no motivation to combine the cited references. The Office Action asserts that because Hoff and Ruzyllo disclose the use of atomic oxygen, which lowers the temperature requirements in forming an oxide layer, i.e., lowers the thermal budget, proper motivation has been provided and Wang would employ the teachings of Hoff or Ruzyllo.

Applicants respectfully submit, however, that lowering the temperature in forming an oxide layer is only one thermal budget constraint. The oxidation time period is another processing parameter that must be considered in determining whether to combine references. Although Hoff and Ruzyllo disclose that using atomic oxygen lowers the oxidation temperature, one skilled in the art would have believed that at the time the application was filed, reducing the oxidation temperature would increase the time of the oxidation process.

In the present case, one skilled in the art would believe that Wang's process would require 80 minutes of oxidation time rather than 40 minutes, to make 50 Å of oxide at a temperature of 400°C rather than 950°C in the presence of atomic oxygen. In other words, there is no motivation to combine the references since increased processing time is undesirable in fabrication processes. The number of devices that could be fabricated would be dramatically reduced if the time period to form them was doubled. Simply put, the thermal budget in Wang would be increased at the expense of the increased oxidation time even though a lower temperature could be employed.

Moreover, even if the references are properly combinable, which they are not, they still would fail to teach a method of forming a flash memory cell comprising "an insulating layer . . . [with a second oxide layer] formed to have a thickness of about least 60% of the targeted thickness of the second oxide layer . . . with an in situ steam generation process," as recited in claim 1, or a method of forming an ONO structure by "growing a second oxide layer . . . at a temperature of about 850°C to about 1100°C, for about 1 second to about 10 minutes, using a gas ambient containing atomic oxygen . . . with an in situ steam generation process," as recited in claim 16, or a method of forming a flash memory array with a plurality of flash memory cells with "an insulating layer comprising a . . . [second oxide layer] grown in the presence of atomic oxygen at a temperature of less than about 900°C for a period of about 1 second to 10 minutes with an in situ steam generation process," as recited in claim 31.

Claims 2-3 and 6-15 depend from claim 1, claims 18 and 21-30 depend from claim 16, and claims 34-45 depend from claim 31. These claims are at least allowable for the reasons set forth above regarding independent claims 1, 16, and 31.

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to withdraw the outstanding rejection of the claims and to pass this application to issue.

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Respectfully submitted,

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